VA NATIONAL CENTER ON HOMELESSNESS AMONG VETERANS
Promoting data-driven, evidence-based solutions to end Veteran homelessness

RESEARCH BRIEF

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Predictive Modeling of Housing Instability and Homelessness in the Veterans Health Administration

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What do we know?

There are increasing efforts to address housing instability and homelessness within health care systems, including the Veterans Health Administration (VHA).[1-3] These efforts rely on the accurate identification of those who are, or are at risk of, experiencing housing instability. Since the beginning of Federal Fiscal Year 2013 the VHA has administered the Homelessness Screening Clinical Reminder (HSCR)—a two-question screening instrument for housing instability and homelessness—to all Veterans who access VHA outpatient care.[4] Prior studies have documented the challenges of effectively using information from self-reported screening instruments like the HSCR.[5-9] These challenges fall into two broad categories: (1) determining how to resolve the logistical, resource, and workload issues associated with the collection of information about housing instability and other social factors from patients; and (2) optimizing procedures for taking action on such information.

Knowledge about which Veterans are at the highest risk of screening positive for housing instability could inform refinements to the implementation of the HSCR, ensuring that it is administered in a way that efficiently uses clinician and system resources. Such knowledge could also help establish standardized procedures to use information about Veterans' risk of housing instability to engage them with appropriate services, similar to existing VHA efforts to use predictive models to identify and engage Veterans at high risk of suicide.[10]

New information provided by the study

We used measures obtained from the medical records of nearly 6 million Veterans to develop and test predictive models of their risk of screening positive for housing instability or homelessness when responding to the HSCR. These models used a wide range of predictors, identified based on known risk factors for homelessness, including demographic characteristics, the presence of health and behavioral conditions, utilization of VHA services and prior history of VHA homeless program use. Our predictive

models used both a conventional statistical model known as logistic regression and a machine-learning algorigthm known as random forests. We used the results of these models to classify Veterans into different risk strata, or categories, based on their predicted probability of screening positive for housing instability or homelessness when responding to the HSCR.

The table below summarizes concentration of risk of positive screening for homelessness among Veterans in different strata of risk. There was strong concentration of the risk among Veterans identified by the predictive models as having the highest risk of reporting current homelessness when responding to the HSCR. Specifically, Veterans identified as being in the top 0.5% in terms of their model-predicted risk accounted for 13% of all those who reported homelessness (or roughly 25.6 times higher than what would be expected by chance alone). Rates of positive screening for homelessness among Veterans in this risk tier were 4.5%--or about 23 times higher than the corresponding rate (0.2%) among all Veterans who responded to the HSCR. Veterans in the top 25% in terms of their model-predicted risk of reporting homelessness accounted for about 85% of those who actually did report homelessness, and those in the top 50% accounted for nearly all (96%) who actually did screen positive for current homelessness when responding to the HSCR. Results of the predictive models for any housing instability were similar.

Table: Concentration of Risk of Screening Positive for Homelessness, by Strata of Predicted Probability

Strata of predicted probability of homelessness, %	% of all positive screens	Ratio of observed to expected positive screens	% with positive screen
0.5	12.8	25.6	4.5
1	18.9	18.9	3.3
5	41.9	8.4	1.5
10	59.2	5.9	1.0
25	84.5	3.4	0.6
50	96.3	1.9	0.3
75	99.1	1.3	0.2
100	100	1.0	0.2

Our predictive models could be used to inform refinements to the administration of the HSCR and to guide action in instances when Veterans are identified as being at high risk of reporting housing instability or homelessness. For example, one refinement would be to administer the HSCR only to those Veterans predicted by our model to be at a high risk (e.g., in the top 50%) of screening positive, which would minimize the workload burden placed on providers. An alternative approach might be to maintain universal administration of the HSCR, but screen those in lower risk strata less frequently and those in higher risk strata more frequently. The models could also be used to identify and proactively engage high-risk Veterans with appropriate services, even before they respond to the HSCR. For example, VA social work and homeless program staff could conduct targeted outreach efforts to high-risk Veterans to conduct more in-depth assessments and facilitate linkages to services. The VHA has used predictive models in this manner to identify and conduct outreach to Veterans at a high risk of suicide,[10] and targeting interventions in this manner has the potential of preventing housing instability or homelessness before they occur.

This brief is based on the following longer study: Byrne, T., Montgomery, A. E., & Fargo, J. D. (2019). Predictive modeling of housing instability and homelessness in the Veterans Health Administration. Health Services Research, 54(1), 75-85.

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